WHAT IS CLAIMED IS:

1. A gear change control system of a belt-type continuously variable transmission, comprising:

I) a movable pulley piston chamber for causing a thrust force to a movable pulley which varies a groove width of each of a primary pulley and a secondary pulley, the movable pulley piston chamber having a double-piston constitution including:

a) a clamp chamber including a primary clamp chamber and a secondary clamp chamber, for causing a clamp force of clamping the belt, and

b) a cylinder chamber including a primary pulley cylinder chamber and a secondary pulley cylinder chamber, for causing a differential thrust force at a gear change;

II) a communication passage communicating the primary clamp chamber with the secondary clamp chamber, a clamp chamber's applied pressure area on a primary side being substantially equal to a clamp chamber's applied pressure area on a secondary side;

III) a gear change control valve for controlling an oil pressure of the cylinder chamber;

IV) a clamping force setting valve disposed between an oil pressure source and the communication passage, the clamping force setting valve setting an oil pressure of the clamp chamber; and

V) a gear change control section for achieving a certain gear change ratio by outputting an instruction signal to the gear change control valve and the clamping force setting valve in accordance with a sensed traveling state, the gear change control section including;

a) a primary thrust force calculating section for calculating a primary thrust force of the movable pulley on the primary side,

b) a secondary thrust force calculating section for calculating a secondary thrust force of the movable pulley on the secondary side,

c) a thrust force selecting section for selecting one of the primary thrust force and the secondary thrust force that is greater than the other, and

d) a clamp chamber oil pressure setting section for setting up a clamp chamber oil pressure by a following calculation:

dividing the selected one of the primary thrust force and the secondary thrust force by an addition of:

the clamp chamber's applied pressure area of one of the primary clamp chamber and the secondary clamp chamber, and

a cylinder chamber's applied pressure area of the cylinder chamber on a selected side.

2. The gear change control system of the belt-type continuously variable transmission, as claimed in claim 1,

wherein

the gear change control system further comprises:

I) an output torque sensing section for sensing an output torque of the belt-type continuously variable transmission,

II) an input torque converting section for obtaining a converted input torque from the sensed output torque, and

III) an input torque estimating section for obtaining an estimated input torque, and

wherein

when the converted input torque is over the estimated input torque, the clamp chamber oil pressure is set to be substantially maximized.

3. The gear change control system of the belt-type continuously variable transmission, as claimed in claim 1,

wherein

the communication passage has an oil pressure sensor for sensing the oil pressure, and

when a sensed actual clamp chamber oil pressure is greater than a clamp chamber setting oil pressure by a predetermined value, the clamp chamber oil pressure is set to be substantially maximized.

4. The gear change control system of the belt-type continuously variable transmission, as claimed in claim 1,

wherein

the gear change control system further comprises:

I) an actual gear ratio sensing section for sensing an actual gear change ratio, and

II) a differential thrust force calculating section for calculating a deviation of the sensed actual gear change ratio from a target gear change ratio, and for calculating the differential thrust force between the primary thrust force and the secondary thrust force based on the calculated deviation, and

wherein

with a gear change instruction outputted, the gear change control section allows the clamp chamber oil pressure setting section to set up the clamp chamber oil pressure based on the thrust force which is obtained when the target gear change ratio is reached, and

a differential pressure capable of causing the calculated differential thrust force is caused by the cylinder chamber.

5. The gear change control system of the belt-type continuously variable transmission, as claimed in claim 2,

when the converted input torque is over a certain numeral times the estimated input torque, the clamp chamber oil pressure is set to be substantially maximized.

6. The gear change control system of the belt-type continuously variable transmission, as claimed in claim 5,

the certain numeral is in a range from 1.2 to 1.5.

7. The gear change control system of the belt-type continuously variable transmission, as claimed in claim 3,

wherein

the clamp chamber setting oil pressure is a target clamp chamber oil pressure.

8. The gear change control system of the belt-type continuously variable transmission, as claimed in claim 1,

wherein

the primary pulley cylinder chamber and the secondary pulley cylinder chamber have substantially the equal cylinder chamber's applied pressure area.

9. The gear change control system of the belt-type continuously variable transmission, as claimed in claim 8,

wherein

the primary thrust force is a force for the movable pulley on the primary side, while the secondary thrust force is a force for the movable pulley on the secondary side,

the clamp chamber oil pressure is an oil pressure that is inputted to the primary clamp chamber and the secondary clamp chamber, and

a primary pulley cylinder chamber oil pressure is inputted to the primary pulley cylinder chamber, and a secondary pulley cylinder chamber oil pressure is inputted to the secondary pulley cylinder chamber.

10. The gear change control system of the belt-type continuously variable transmission, as claimed in claim 9,

wherein

the primary thrust force and the secondary thrust force are given respectively by the following expression (A) and expression (B):

$$Fzp = Pp \cdot Asft + Pcl \cdot Acl \quad \cdots \quad \text{Expression (A)}$$

$$Fzs = Ps \cdot Asft + Pcl \cdot Acl \quad \cdots \quad \text{Expression (B)}$$

where: Fzp is the primary thrust force,

Fzs is the secondary thrust force,

Pp is the primary pulley cylinder chamber oil pressure,

Ps is the secondary pulley cylinder chamber oil pressure,

Pcl is the clamp chamber oil pressure,

Asft is the cylinder chamber's applied pressure area of any one of the primary pulley cylinder chamber and the secondary pulley cylinder chamber, and

Acl is the clamp chamber's applied pressure area of any one of the primary clamp chamber and the secondary clamp chamber,

the cylinder chamber's applied pressure area and the clamp chamber's applied pressure area are substantially fixed, while the primary pulley cylinder chamber oil

pressure, the secondary pulley cylinder chamber oil pressure and the clamp chamber oil pressure are parameters,

for holding the certain gear change ratio with a discharge oil pressure from the oil pressure source which is an oil pump kept low, substantially a maximum oil pressure among the primary pulley cylinder chamber oil pressure, the secondary pulley cylinder chamber oil pressure and the clamp chamber oil pressure is to be substantially minimized, and

the primary thrust force and the secondary thrust force have substantially the equal clamp chamber oil pressure, thereby, an element of a difference between the primary pulley cylinder chamber oil pressure and the secondary pulley cylinder chamber oil pressure determines the differential thrust force.

11. The gear change control system of the belt-type continuously variable transmission, as claimed in claim 10,

wherein

changing the expression (A) and the expression (B) with $Pp \cdot Asft = Yp$, $Ps \cdot Asft = Ys$, and $Pcl \cdot Acl = X$ brings about the following expression (C) and expression (D):

$Yp = -X + Fzp$ ··· Expression (C)

$Ys = -X + Fzs$ ··· Expression (D),

a first assumption is made such that $Fzp > Fzs$, making the following case 1) and case 2):

case 1) in which the secondary thrust force which is the smaller thrust force is paid attention to:

for substantially minimizing the maximum oil pressure among the secondary pulley cylinder chamber oil pressure and the clamp chamber oil pressure, $Ps = Pcl$ is determined, and $X = Xs$ herein is defined,

since $Pp > Ps$, the primary pulley cylinder chamber oil pressure is maximized, thereby, maximizing one oil pressure out of three kinds of the oil pressures,

case 2) in which the primary thrust force which is the greater thrust force is paid attention to:

for substantially minimizing the maximum oil pressure among the primary pulley cylinder chamber oil pressure and the clamp chamber oil pressure, Pp = Pcl is determined, and X = Xp herein is defined,

since Pp > Ps and the secondary pulley cylinder chamber oil pressure is smaller than Xp, the primary pulley cylinder chamber oil pressure and the clamp chamber oil pressure are maximized, thereby maximizing two kinds of the oil pressures out of the three kinds of the oil pressures meets the minimizing of the maximum, and

the clamp chamber oil pressure is thereby calculated by the following expression (E):

$$Pcl = Fzp/(Asft + Acl) \quad \cdots \quad \text{Expression (E).}$$

12. The gear change control system of the belt-type continuously variable transmission, as claimed in claim 11,

wherein

when a second assumption is made such that Fzp < Fzs, the clamp chamber oil pressure is calculated by the following expression (F):

$$Pcl = Fzs/(Asft + Acl) \quad \cdots \quad \text{Expression (F).}$$

13. The gear change control system of the belt-type continuously variable transmission, as claimed in claim 12,

wherein

based on the greater one of the primary thrust force and the secondary thrust force, the primary pulley cylinder chamber oil pressure of the primary pulley cylinder chamber, the secondary pulley cylinder chamber oil pressure of the secondary pulley cylinder chamber, the clamp chamber oil pressure of the primary clamp chamber and the clamp chamber oil pressure of the secondary clamp chamber are substantially equalized, thereby minimizing the maximum oil pressure of the three kinds of oil pressures.

14. A gear change control method of a belt-type continuously variable transmission which includes: I) a movable pulley piston chamber for causing a thrust force to a movable pulley which varies a groove width of each of a primary pulley and a secondary pulley, the pulley piston chamber having a double-piston constitution including: a)

clamp chamber including a primary clamp chamber and a secondary clamp chamber, for causing a clamp force of clamping the belt, and b) a cylinder chamber including a primary pulley cylinder chamber and a secondary pulley cylinder chamber, for causing a differential thrust force at a gear change; II) a communication passage communicating the primary clamp chamber with the secondary clamp chamber, a clamp chamber's applied pressure area on a primary side being substantially equal to a clamp chamber's applied pressure area on a secondary side; III) a gear change control valve for controlling an oil pressure of the cylinder chamber; IV) a clamping force setting valve disposed between an oil pressure source and the communication passage, the clamping force setting valve setting an oil pressure of the clamp chamber; and V) a gear change control section for achieving a certain gear change ratio by outputting an instruction signal to the gear change control valve and the clamping force setting valve in accordance with a sensed traveling state,

the gear change control method comprising:

a) a first step for calculating a primary thrust force of the movable pulley on the primary side,

b) a second step for calculating a secondary thrust force of the movable pulley on the secondary side,

c) a third step for selecting one of the primary thrust force and the secondary thrust force that is greater than the other, and

d) a fourth step for setting up a clamp chamber oil pressure by a following calculation:

dividing the selected one of the primary thrust force and the secondary thrust force by an addition of:

the clamp chamber's applied pressure area of one of the primary clamp chamber and the secondary clamp chamber, and

a cylinder chamber's applied pressure area of the cylinder chamber on a selected side.

15. A gear change control system of a belt-type continuously variable transmission which includes: I) a movable pulley piston chamber for causing a thrust force to a movable pulley which varies a groove width of each of a primary pulley and a secondary

pulley, the pulley piston chamber having a double-piston constitution including: a) a clamp chamber including a primary clamp chamber and a secondary clamp chamber, for causing a clamp force of clamping the belt, and b) a cylinder chamber including a primary pulley cylinder chamber and a secondary pulley cylinder chamber, for causing a differential thrust force at a gear change; II) a communication passage communicating the primary clamp chamber with the secondary clamp chamber, a clamp chamber's applied pressure area on a primary side being substantially equal to a clamp chamber's applied pressure area on a secondary side; III) a gear change control valve for controlling an oil pressure of the cylinder chamber; IV) a clamping force setting valve disposed between an oil pressure source and the communication passage, the clamping force setting valve setting an oil pressure of the clamp chamber; and V) a gear change control section for achieving a certain gear change ratio by outputting an instruction signal to the gear change control valve and the clamping force setting valve in accordance with a sensed traveling state,

the gear change control system comprising:

a) a first means for calculating a primary thrust force of the movable pulley on the primary side,

b) a second means for calculating a secondary thrust force of the movable pulley on the secondary side,

c) a third means for selecting one of the primary thrust force and the secondary thrust force that is greater than the other, and

d) a fourth means for setting up a clamp chamber oil pressure by a following calculation:

dividing the selected one of the primary thrust force and the secondary thrust force by an addition of:

the clamp chamber's applied pressure area of one of the primary clamp chamber and the secondary clamp chamber, and

a cylinder chamber's applied pressure area of the cylinder chamber on a selected side.